L3 ANSWER 1 OF 5 CAPLUS COPYRIGHT 2001 ACS
ACCESSION NUMBER: 2001:31254 CAPLUS
DOCUMENT NUMBER: 134:96241
TITLE: Transgenic rice with iron deficiency tolerance having **nicotianamine aminotransferase gene**
INVENTOR(S): Mori, Satoshi; Nakanishi, Hiromi; Takahashi, Michiko; Nishizawa, Naoko
PATENT ASSIGNEE(S): Japan Science and Technology Corporation, Japan
SOURCE: PCT Int. Appl., 61 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2001001762	A1	20010111	WO 2000-JP4425	20000704
W: AU, CN, IN, KR, US				
RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE				
JP 2001017012	A2	20010123	JP 1999-190318	19990705

PRIORITY APPLN. INFO.: JP 1999-190318 A 19990705

AB A gramineous plant (Gramineae) having tolerance to iron deficiency and capable of vigorously growing even in calcareous alk. soil, constructed by transferring a gene for an enzyme in the mugineic acids biosynthesis pathway in gramineous plants into a gramineous plant, is disclosed. A method of constructing a transgenic rice having improved iron absorbability having a **gene** encoding **nicotianamine aminotransferase** (NAAT); and seeds, cells, and crops from the plant, are claimed. Nicotianamine aminotransferase (NAAT), the key enzyme involved in the biosynthesis of mugineic acid family phytosiderophores (MAs), catalyzes the amino transfer of nicotianamine (NA). MAs are found only in graminaceous plants, although NA has been detected in every plant so far investigated. Therefore, this amino transfer reaction is the first step in the unique biosynthesis of MAs that has evolved in graminaceous plants. NAAT activity is dramatically induced by Fe deficiency and suppressed by Fe resupply. Based on the protein sequence of NAAT purified from Fe-deficient barley (Hordeum vulgare) roots, two distinct cDNA clones encoding NAAT, naat-A and naat-B, were identified. Their deduced amino acid sequences were homologous to several aminotransferases, and shared consensus sequences for the pyridoxal phosphate-binding site lysine residue and its surrounding residues. The expression of both naat-A and naat-B is increased in Fe-deficient barley roots, while naat-B has a low level of constitutive expression in Fe-sufficient barley roots. No detectable mRNA from either naat-A or naat-B was present in the leaves of either Fe-deficient or Fe-sufficient barley. One genomic clone with a tandem array of naat-B and naat-A in this order was identified. Naat-B and naat-A each have six introns at the same locations. The isolation of NAAT genes will pave the way to understanding the mechanism of the response to Fe in graminaceous plants, and may lead to the development of

cultivars tolerant to Fe deficiency that can grow in calcareous soils. Acquisition of iron deficiency tolerance in rice transformed with barley NAAT encoding genes naat-A and naat-B, under the regulation of CaMV 35S promoter, was demonstrated.

REFERENCE COUNT: 4

REFERENCE(S): (1) Anon; Plant Physiol 1999, V121(3), P947
(2) Anon; Plant Physiol 1999, V121(3), P947
(3) Anon; Soil Sci Plant Nutr 1997, V43, P975
(4) Anon; Soil Sci Plant Nutr 1997, V43, P975

L3 ANSWER 2 OF 5 CAPLUS COPYRIGHT 2001 ACS

ACCESSION NUMBER: 2000:607224 CAPLUS
DOCUMENT NUMBER: 134:71001
TITLE: Production of plants with resistance to iron deficiency in alkali soil
AUTHOR(S): Mori, Satoshi
CORPORATE SOURCE: Graduate School, University of Tokyo, Japan
SOURCE: Nogyo oyobi Engei (2000), 75(8), 887-894
CODEN: NOOEAJ; ISSN: 0369-5247
PUBLISHER: Yokendo
DOCUMENT TYPE: Journal; General Review
LANGUAGE: Japanese

AB The essentiality of Fe, the Strategy I and Strategy II mechanisms of Fe uptake in higher plants, the biosynthetic pathway for the mugineic acid family phytosiderophores, nicotianamine synthase, and nicotianamine aminotransferase (NAAT) are discussed. Prodn. of Fe deficiency-tolerant rice by introducing naat-A or naat-B genes is reported. Under Fe-deficient conditions, NAAT comparative activity was 5 times higher and the amt. of deoxymugineic acid secreted was 3.5-fold that of the wild-type strain.

L3 ANSWER 3 OF 5 AGRICOLA DUPLICATE 1

ACCESSION NUMBER: 2000:60343 AGRICOLA
DOCUMENT NUMBER: IND22060365
TITLE: Cloning two **genes** for **nicotianamine aminotransferase**, a critical enzyme in iron acquisition (strategy II) in graminaceous plants.
AUTHOR(S): Takahashi, M.; Yamaguchi, H.; Nakanishi, H.; Shioiri, T.; Nishizawa, N.K.; Mori, S.
AVAILABILITY: DNAL (450 P692)
SOURCE: Plant physiology, Nov 1999. Vol. 121, No. 3. p. 947-956
Publisher: Rockville, MD : American Society of Plant Physiologists, 1926-
CODEN: PLPHAY; ISSN: 0032-0889
NOTE: Includes references
PUB. COUNTRY: Maryland; United States
DOCUMENT TYPE: Article; Conference
FILE SEGMENT: U.S. Imprints not USDA, Experiment or Extension
LANGUAGE: English

AB Nicotianamine aminotransferase (NAAT), the key enzyme involved in the biosynthesis of mugineic acid family phytosiderophores (MAs), catalyzes the amino transfer of nicotianamine (NA). MAs are found only in graminaceous plants, although NA has been detected in every plant so far investigated. Therefore, this amino transfer reaction is the first step in the unique biosynthesis of MAs that has evolved in graminaceous plants. NAAT activity is dramatically induced by Fe deficiency and suppressed by Fe resupply. Based on the protein sequence of NAAT purified from Fe-deficient barley (Hordeum vulgare) roots, two distinct cDNA clones encoding NAAT, naat-A and naat-B, were identified. Their deduced amino acid sequences were homologous to several aminotransferases, and shared consensus sequences for the pyridoxal phosphate-binding site lysine residue and its surrounding residues. The expression of both naat-A and

naat-B is increased in Fe-deficient barley roots, while naat-B has a low level of constitutive expression in Fe-sufficient barley roots. No detectable mRNA from either naat-A or naat-B was present in the leaves of either Fe-deficient or Fe-sufficient barley. One genomic clone with a tandem array of naat-B and naat-A in this order was identified. naat-B and naat-A each have six introns at the same locations. The isolation of NAAT genes will pave the way to understanding the mechanism of the response to Fe in graminaceous plants, and may lead to the development of cultivars tolerant to Fe deficiency that can grow in calcareous soils.

L3 ANSWER 4 OF 5 CAPLUS COPYRIGHT 2001 ACS
ACCESSION NUMBER: 1998:585899 CAPLUS
DOCUMENT NUMBER: 129:198895
TITLE: Cloning and **cDNA** sequences of **nicotianamine aminotransferase** isoenzymes from iron-deficient barley roots
INVENTOR(S): Mori, Satoshi; Nakanishi, Hiromi; Takahashi, Michiko
PATENT ASSIGNEE(S): Sumitomo Chemical Co., Ltd., Japan
SOURCE: Eur. Pat. Appl., 17 pp.
CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 860499	A2	19980826	EP 1998-102891	19980219
EP 860499	A3	19981104		
R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, FI				
JP 10290694	A2	19981104	JP 1998-28904	19980210
CA 2224130	AA	19980821	CA 1998-2224130	19980219
CN 1195700	A	19981014	CN 1998-107070	19980221

PRIORITY APPLN. INFO.: JP 1997-37499 19970221
AB Complementary **DNA** clones encoding 2 isoenzymes of **nicotianamine aminotransferase** are provided from iron-deficient barley roots. The 2 isoenzymes are 461 and 551 amino acids in length. These enzymes with a single or plural amino acids deleted, replaced or added, and having nicotianamine aminotransferase activity may be used (no data) for enhancement of ability to absorbing insol. iron in soil and for improvement of resistance to iron deficiency in plants.

L3 ANSWER 5 OF 5 CAPLUS COPYRIGHT 2001 ACS
ACCESSION NUMBER: 1996:586037 CAPLUS
DOCUMENT NUMBER: 125:239625
TITLE: A strategy for cloning the genes in the synthetic pathway of mugineic acid-family phytosiderophores
AUTHOR(S): Mori, S.
CORPORATE SOURCE: Faculty Agriculture, University Tokyo, Tokyo, 113, Japan
SOURCE: Genet. Manipulation Crop Plants Enhance Integr. Nutr. Manage. Cropping Syst.--1. Phosphorus, Proc. FAO-ICRISAT Expert Consult. Workshop (1995), Meeting Date 1994, 129-144. Editor(s): Johansen, C. International Crops Research Institute for the Semi-Arid Tropics: Patancheru, India.
CODEN: 63KAAB
DOCUMENT TYPE: Conference
LANGUAGE: English
AB Genes involved in the biosynthetic pathway of mugineic acid-family phytosiderophores were cloned. Initially, the **genes** for nicotianamine synthase and **nicotianamine**

aminotransferase were confirmed to be induced by iron (Fe) deficiency and were partially purified. The partial amino acid sequences of the "d" peptide were detd. on 2D-PAGE, which appeared to be specific to Fe-deficient barley roots. Finally, seven Fe-deficiency specific clones were selected by "differential screening" of a cDNA library constructed from Fe-deficient barley roots and three DNA clones (Ids1, Ids2, and Ids3) were sequenced from amongst these. Strategies to clone the genes essential for the synthesis of phytosiderophores are discussed.

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FILE 'AGRICOLA' ENTERED AT 09:37:15 ON 27 SEP 1999

=> s nicotianamine aminotransferase

L1          12 NICOTIANAMINE AMINOTRANSFERASE

=> d l1 1-12


L1   ANSWER 1 OF 12  CAPLUS  COPYRIGHT 1999 ACS
AN   1999:424322  CAPLUS
TI   Iron acquisition by plants
AU   Mori, Satoshi
CS   Laboratory of Plant Molecular Physiology, Department of Applied
Biological
     Chemistry, The University of Tokyo, Tokyo, 113-8657, Japan
SO   Curr. Opin. Plant Biol. (1999), 2(3), 250-253
     CODEN: COPBFZ; ISSN: 1369-5266
PB   Current Biology Publications
DT   Journal
LA   English

L1   ANSWER 2 OF 12  CAPLUS  COPYRIGHT 1999 ACS
AN   1999:30278  CAPLUS
DN   130:206550
TI   Characterizing nicotianamine aminotransferase:
     improving its assay system and details of the regulation of its activity
     by Fe nutrition status
AU   Kanazawa, Kenji; Higuchi, Kyoko; Nakanishi, Hiromi; Kishi-Nishizawa,
```

Naoko; Mori, Satoshi
CS Laboratory of Plant Molecular Physiology, Department of Applied Biological
Chemistry, The University of Tokyo, Tokyo, 113-8657, Japan
SO Soil Sci. Plant Nutr. (Tokyo) (1998), 44(4), 717-721
CODEN: SSPNAW; ISSN: 0038-0768
PB Japanese Society of Soil Science and Plant Nutrition
DT Journal
LA English

L1 ANSWER 3 OF 12 CAPLUS COPYRIGHT 1999 ACS
AN 1998:585899 CAPLUS
DN 129:198895
TI Cloning and cDNA sequences of **nicotianamine aminotransferase** isoenzymes from iron-deficient barley roots
IN Mori, Satoshi; Nakanishi, Hiromi; Takahashi, Michiko
PA Sumitomo Chemical Co., Ltd., Japan
SO Eur. Pat. Appl., 17 pp.
CODEN: EPXXDW
DT Patent
LA English
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 860499	A2	19980826	EP 1998-102891	19980219
	EP 860499	A3	19981104		
	R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, FI				
	JP 10290694	A2	19981104	JP 1998-28904	19980210
	CA 2224130	AA	19980821	CA 1998-2224130	19980219
	CN 1195700	A	19981014	CN 1998-107070	19980221
PRAI	JP 1997-37499		19970221		

L1 ANSWER 4 OF 12 CAPLUS COPYRIGHT 1999 ACS
AN 1998:175071 CAPLUS
DN 128:229742
TI Reevaluation of the genes induced by iron deficiency in barley roots
AU Mori, Satoshi
CS Laboratory of Plant Molecular Physiology, The University of Tokyo, Tokyo, 113, Japan
SO Soil Sci. Plant Nutr. (Tokyo) (1997), 43(Spec. Issue), 975-980
CODEN: SSPNAW; ISSN: 0038-0768
PB Japanese Society of Soil Science and Plant Nutrition
DT Journal; General Review
LA English

L1 ANSWER 5 OF 12 CAPLUS COPYRIGHT 1999 ACS
AN 1996:586037 CAPLUS
DN 125:239625
TI A strategy for cloning the genes in the synthetic pathway of mugineic acid-family phytosiderophores
AU Mori, S.
CS Faculty Agriculture, University Tokyo, Tokyo, 113, Japan
SO Genet. Manipulation Crop Plants Enhance Integr. Nutr. Manage. Cropping Syst.--1. Phosphorus, Proc. FAO-ICRISAT Expert Consult. Workshop (1995), Meeting Date 1994, 129-144. Editor(s): Johansen, C. Publisher: International Crops Research Institute for the Semi-Arid Tropics, Patancheru, India.
CODEN: 63KAAB
DT Conference
LA English

L1 ANSWER 6 OF 12 CAPLUS COPYRIGHT 1999 ACS
AN 1995:889559 CAPLUS
DN 123:280965
TI Detection of two distinct isoenzymes of **nicotianamine**

aminotransferase in Fe-deficient barley roots
AU Kanazawa, Kenji; Higuchi, Kyoko; Nishizawa, Naoko-Kishi; Fushiya, Shinji; Mori, Satoshi
CS Dep. Appl. Biol. Chem., Univ. Tokyo, Tokyo, 113, Japan
SO J. Exp. Bot. (1995), 46(290), 1241-4
CODEN: JEBOA6; ISSN: 0022-0957
DT Journal
LA English

L1 ANSWER 7 OF 12 CAPLUS COPYRIGHT 1999 ACS
AN 1995:353916 CAPLUS
DN 122:128656
TI **Nicotianamine aminotransferase** activities are correlated to the phytosiderophore secretions under Fe-deficient conditions in Gramineae
AU Kanazawa, Kenji; Higuchi, Kyoko; Nishizawa, Naoko-Kishi; Fushiya, Shinji; Chino, Mitsuo; Mori, Satoshi
CS Department of Agricultural Chemistry, University of Tokyo, Tokyo, 113, Japan
SO J. Exp. Bot. (1994), 45(281), 1903-6
CODEN: JEBOA6; ISSN: 0022-0957
DT Journal
LA English

L1 ANSWER 8 OF 12 CAPLUS COPYRIGHT 1999 ACS
AN 1995:74597 CAPLUS
DN 122:154736
TI Biosynthetic pathway of phytosiderophores in iron-deficient graminaceous plants: a new assay system for the detection of **nicotianamine aminotransferase** activity
AU Kanazawa, K.; Mihashi, S.; Nishizawa, N.K.; Chino, M.; Mori, S.
CS Department of Agricultural Chemistry, University of Tache, Tache, 113, Japan
SO Dev. Plant Soil Sci. (1993), 54(Plant Nutrition), 107-9
CODEN: DVPSD8; ISSN: 0167-840X
DT Journal
LA English

L1 ANSWER 9 OF 12 CAPLUS COPYRIGHT 1999 ACS
AN 1994:476769 CAPLUS
DN 121:76769
TI Biosynthetic pathway of phytosiderophores in iron-deficient graminaceous plants. Development of an assay system for the detection of **nicotianamine aminotransferase** activity
AU Ohata, Tomoko; Kanazawa, Kenji; Mihashi, Shuichi; Kishi-Nishizawa, Naoko; Fushiya, Shinji; Nozoe, Shigeo; Chino, Mitsuo; Mori, Satoshi
CS Dep. Agric. Chem., Univ. Tokyo, Tokyo, 113, Japan
SO Soil Sci. Plant Nutr. (Tokyo) (1993), 39(4), 745-9
CODEN: SSPNAW; ISSN: 0038-0768
DT Journal
LA English

L1 ANSWER 10 OF 12 CAPLUS COPYRIGHT 1999 ACS
AN 1994:292566 CAPLUS
DN 120:292566
TI Biosynthetic pathway of phytosiderophores in iron-deficient graminaceous plants: a new assay system for the detection of **nicotianamine aminotransferase** activity
AU Kanazawa, K.; Mihashi, S.; Nishizawa, N. K.; Chino, M.; Mori, S.
CS Dep. Agric. Chem., Univ. Tache, Tache, 113, Japan
SO Plant Soil (1993), 155-156, 103-5
CODEN: PLSOA2; ISSN: 0032-079X
DT Journal
LA English

L1 ANSWER 11 OF 12 AGRICOLA

AN 96:24795 AGRICOLA
DN IND20508975
TI Detection of two distinct isozymes of **nicotianamine aminotransferase** in Fe-deficient barley roots.
AU Kanazawa, K.; Higuchi, K.; Nishizawa, N.K.; Fushiya, S.; Mori, S.
CS University of Tokyo, Tokyo, Japan.
AV DNAL (450 J8224)
SO Journal of experimental botany, Sept 1995. Vol. 46, No. 290. p. 1241-1244
Publisher: Oxford : Oxford University Press.
CODEN: JEBOA6; ISSN: 0022-0957
NTE Includes references
CY England; United Kingdom
DT Article
FS Non-U.S. Imprint other than FAO
LA English

L1 ANSWER 12 OF 12 AGRICOLA
AN 95:19549 AGRICOLA
DN IND20450263
TI **Nicotianamine aminotransferase** activities are correlated to the phytosiderophore secretions under Fe-deficient conditions in Gramineae.
AU Kanazawa, K.; Higuchi, K.; Nishizawa, N.L.; Fushiya, S.; Chino, M.; Mori, S.
CS University of Tokyo, Tokyo, Japan
AV DNAL (450 J8224)
SO Journal of experimental botany, Dec 1994. Vol. 45, No. 281. p. 1903-1906
Publisher: Oxford : Oxford University Press.
CODEN: JEBOA6; ISSN: 0022-0957
NTE Includes references
CY England; United Kingdom
DT Article
FS Non-U.S. Imprint other than FAO
LA English

=> d l1 4 abs

L1 ANSWER 4 OF 12 CAPLUS COPYRIGHT 1999 ACS
AB A review with many refs. on cloning genes encoding enzymes in the biosynthetic pathway of the mugineic acid family of phytosiderophores. The Fe-deficiency-induced genes which have been cloned in barley roots are **nicotianamine aminotransferase** (naat), formate dehydrogenase (Fdh), adenine phosphoribosyl-transferase (Aprt), alcoholdehydrogenase (Adh), and the iron deficiency specific clones Ids1, Ids2 and Ids3. SAM synthetase (sam) was not induced by Fe deficiency. Genes of nicotianamine synthetase (nas) and a 36kD-peptide were not successfully cloned. The physiol. importance of these genes are discussed.

FILE 'AGRICOLA, CAPLUS, BIOSIS, EMBASE, USPATFULL' ENTERED AT 12:45:28 ON
08 MAY 2001

L2 7 SEA (NICOTIANAMINE AMINOTRANSFERASE) (6A) (DNA# OR CDNA# OR GENE# OR NUCLEIC)
L3 5 DUP REM L2 (2 DUPLICATES REMOVED)
D TI 1-5

FILE HOME

FILE USPATFULL
FILE COVERS 1971 TO PATENT PUBLICATION DATE: 8 May 2001 (20010508/PD)
FILE LAST UPDATED: 8 May 2001 (20010508/ED)
HIGHEST PATENT NUMBER: US6230326
CA INDEXING IS CURRENT THROUGH 8 May 2001 (20010508/UPCA)
ISSUE CLASS FIELDS (/INCL) CURRENT THROUGH: 8 May 2001 (20010508/PD)
REVISED CLASS FIELDS (/NCL) LAST RELOADED: Feb 2001
USPTO MANUAL OF CLASSIFICATIONS THESAURUS ISSUE DATE: Feb 2001

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>>> is included in file records. A thesaurus is available for the <<<
>>> USPTO Manual of Classifications in the /NCL, /INCL, and /RPCL <<<
>>> fields. This thesaurus includes catchword terms from the <<<
>>> USPTO/MOC subject headings and subheadings. Thesauri are also <<<
>>> available for the WIPO International Patent Classification <<<
>>> (IPC) Manuals, editions 1-6, in the /IC1, /IC2, /IC3, /IC4, <<<
>>> /IC5, and /IC (/IC6) fields, respectively. The thesauri in <<<
>>> the /IC5 and /IC fields include the corresponding catchword <<<
>>> terms from the IPC subject headings and subheadings. <<<

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FILE AGRICOLA

FILE COVERS 1970 TO 12 Apr 2001 (20010412/ED)

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FILE COVERS 1947 - 8 May 2001 VOL 134 ISS 20
FILE LAST UPDATED: 7 May 2001 (20010507/ED)

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FILE BIOSIS
FILE COVERS 1969 TO DATE.
CAS REGISTRY NUMBERS AND CHEMICAL NAMES (CNs) PRESENT FROM JANUARY 1969 TO DATE.

RECORDS LAST ADDED: 2 May 2001 (20010502/ED)

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FILE COVERS 1974 TO 3 May 2001 (20010503/ED)

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This file contains CAS Registry Numbers for easy and accurate substance identification.

=> d ti 1-5

L3 ANSWER 1 OF 5 CAPLUS COPYRIGHT 2001 ACS
TI Transgenic rice with iron deficiency tolerance having **nicotianamine aminotransferase gene**

L3 ANSWER 2 OF 5 CAPLUS COPYRIGHT 2001 ACS
TI Production of plants with resistance to iron deficiency in alkali soil

L3 ANSWER 3 OF 5 AGRICOLA DUPLICATE 1
TI Cloning two **genes** for **nicotianamine aminotransferase**, a critical enzyme in iron acquisition (strategy II) in graminaceous plants.

L3 ANSWER 4 OF 5 CAPLUS COPYRIGHT 2001 ACS
TI Cloning and **cDNA** sequences of **nicotianamine aminotransferase** isoenzymes from iron-deficient barley roots

L3 ANSWER 5 OF 5 CAPLUS COPYRIGHT 2001 ACS
TI A strategy for cloning the genes in the synthetic pathway of mugineic acid-family phytosiderophores